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FISH AND WILDLIFE SERVICE

BUREAU OF SPORT FISHERIES AND WILDLIFE

BOSTON, MASSACHUSETTS

WETLANDS INVENTORY OF MASSACHUSETTS

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WETLANDS INVENTORY OF MASSACHUSETTS

Purpose and Scope of Inventory

In 1953-54, as a result of increasing losses of wetlands of value to wildlife due to agricultural drainage, filling for industry, housing, and recreation, a national inventory of the remaining wetlands was undertaken by the United States Fish and Wildlife Service with the cooperation of various State fish and game agencies. The purpose of the inventory was to determine the location, quality, and acreage of the remaining wildlife-wetlands. Data collected were published in 1956 in Wetlands of the United States, Circular 39, U. S. Fish and Wildlife Service, Washington, D. C.

The national inventory, due to time and manpower limitations, had as its goal a survey of those wetland regions which contained 90 percent of the wetlands of importance to waterfowl in the State. Thus, in Massachusetts, all of the wetlands in the State were covered except in Franklin, Hampden, and Hampshire Counties where only the wetlands along the Connecticut River were included. Data gathered on that survey appeared in the report Wetlands Inventory of Massachusetts, published in October 1954.

In 1955, two years after the original wetlands inventory was made, another survey was conducted to determine the vulnerability status of all high and moderate value wetlands in Massachusetts. The primary purpose of the vulnerability survey was to determine which wetlands were in danger of being destroyed and what

the decimating factors were. Each high or moderate value wetland was rated and mapped according to the following definitions:

Class 1 - A wetland in which a known agent is adversely affecting the area for wildlife or is expected to do so within a 5-year period.

Class 2 - A wetland in which no known agent is adversely affecting the area for wildlife, but in which there is a possibility that some factor will become operative in the near future.

Class 3 - A wetland in which no loss of value is anticipated.

In June 1959, a resurvey of the State's high and moderate value wetlands was conducted for the purpose of determining the amount and location of wetlands destroyed since 1955 and to consider their present vulnerability to destruction. This survey also included all of the coastal marshes evaluated as low and negligible from the waterfowl standpoint. The inclusion of these wetlands was due to recent discoveries of their importance as spawning and nursery areas for finfish and shellfish. Also, tidal wetlands and estuarine areas are believed to have a significant role in the accumulation and release of basic nutrients essential to maintenance of marine life of great commercial and recreational value.

Collection of data was made possible through the fine cooperation of personnel of the Massachusetts Division of Fisheries and Game, including Charles McLaughlin, Director, and E. Michael Pollack, Allan Kennedy, Joseph A. Hagar, Emerson Chandler,

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Russell A. Cookingham, and James M. Sheppard; William G. Sheldon, Massachusetts Cooperative Wildlife Research Unit; personnel of the U. S. Soil Conservation Service, including Dr. Benjamin Isgor, William H. Coates, Christopher G. Moustakis, Roger C. Williams, John P. Westcott, Carl O. Clark, Clarence W. Parker, Rino J. Roffinoli, Gayland E. Folley, Wilson O. Hill, William F. Warren, William N. Andrews, Emerson D. Mowry, and Vernon F. Johnson; and Oscar T. Doane, Jr., Superintendent of the Cape Cod Mosquito Control Project.

Procedures

The bulk of the data presented herein were gathered by the following methods. Geographic areas of importance to waterfowl were outlined on a State map by State waterfowl technicians. These areas were then expanded in several cases so as to be delimited by major political boundaries. Within the major areas, all wetland units of 40 acres or more were determined from and outlined on U.S.G.S. topographic maps.

Each wetland area was classified as to type.[1/] Classifications of inland areas were determined by stereoscopic examination of aerial photographs, with frequent field checks to verify or correct the results. Aerial photographs were inadequate in revealing classifications of coastal areas; consequently, classifications of almost all coastal areas were determined from

1/ The 20 wetland types occurring in this Country are described in the Fish and Wildlife Service's "Classification of Wetlands in the United States. Special Scientific Report: Wildlife No. 20, June 1953."

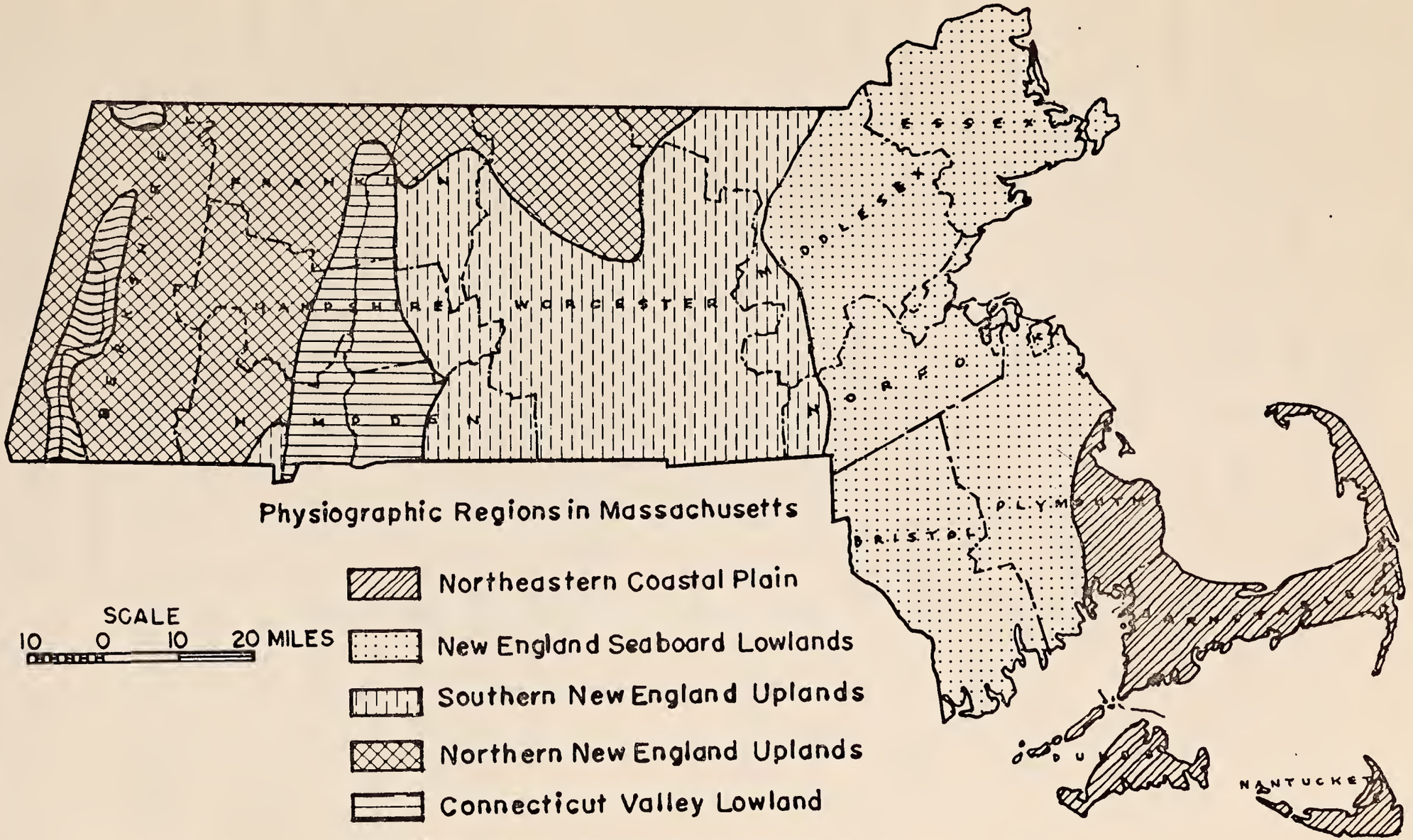
field examinations. When possible, delineation of the various types was made on topographic maps and acreages determined by planimetering or by use of a grid.

Sounds and bays of importance to waterfowl were indicated on U. S. Coast and Geodetic maps by State personnel, and the acreage of these areas was computed by planimetering. The acreage totals of shallow coastal waters is subject to adjustment, since it is impossible for State personnel to locate exactly all areas and since all the bottom within the outlined areas is not necessarily important to waterfowl. However, the compilations do indicate the extent of the highly valuable offshore feeding areas. Coastal areas of importance to waterfowl lying beyond mean low water are not included in the summaries but are quite extensive and of prime importance to wintering and migrating populations of diving ducks, especially in the Cape Cod region.

A waterfowl value rating of High, Moderate, Low, or Negligible was assigned to each wetland unit by State technicians who had knowledge of local waterfowl use of the area. All phases of the life cycles of waterfowl species were considered of equal importance in determining values based on waterfowl use.

The reliability of the data are considered to be good insofar as the requisites of the present survey are concerned.

The procedures for conducting the vulnerability surveys of 1955 and 1959 were similar to those used in making the original wetlands inventory.



Physiographic Regions in Massachusetts

Plate I

Coverage

The geographic areas which were delineated for inclusion in the inventory are shown on plate I. All individual wetlands having an area of 40 acres or more within the sections have been classified and evaluated. The location and waterfowl values of specific areas are indicated on plate II.

In the eleven counties where complete coverage was made, the total acreage of wetland areas 40 acres or more in size amounts to 73 percent of the total wetlands of all sizes indicated on U.S.G.S. topographic maps for those counties. For the entire State, it is estimated that there are about 220,000 acres of wetland (exclusive of open water types) included in areas 40 acres or more in size, of which approximately 205,000 acres, or 93 percent were inventoried.

Description of Wetland Types

To assure nationwide uniformity in the data to be collected, the Fish and Wildlife Service set up a classification system for the wetlands of the country. Four main groups were established as follows: Inland Fresh areas with 8 types; Inland Saline with 3 types; Coastal Fresh with 3 types; and Coastal Saline with 6 types. Of the 20 wetland types, 12 are reported on in the present inventory and 3 others are present in the State but in insignificant acreages. These types are described below and their value to waterfowl indicated.

Type 1 - Seasonally flooded basins and flats - This type is found on river bottoms and on the margins of lakes, ponds, and reservoirs.

Vegetation varies greatly in Massachusetts, ranging from bottomland woods to herbaceous growths. It is utilized by waterfowl for feeding area when flooded.

Type 2 - Fresh meadows - The soil of this type is waterlogged and it contains such vegetation as sedges, grasses, threesquares, and various broad-leaved plants. It is used mostly as feeding ground by waterfowl, but where favorable conditions occur, some nesting takes place.

Type 3 - Shallow fresh marshes - This type borders lakes, ponds, and deep marshes, or it may fill shallow wet areas. The vegetation is composed of such species as cattails, bulrushes, and arrowheads. It is a very important type, used for nesting and feeding.

Type 4 - Deep fresh marshes - This type is covered by from 6 inches to 3 feet of water and contains vegetation of cattails, wildrice, and bulrushes. It is the most important inland type for waterfowl and is used for feeding and, in some cases, nesting.

Type 5 - Open fresh water - This type comprises inland water areas which are of variable depth, up to 10 feet in lakes, ponds, and reservoirs. Vegetation consists of sago pondweeds, water lilies, and other aquatic forms. When fringed by marsh or when aquatic vegetation is plentiful, this type is of high value for waterfowl.

Type 6 - Shrub swamps - The soil in this type is usually waterlogged and it may be covered with as much as 6 inches of water.

It contains such vegetation as alders, buttonbush, dogwoods, etc. This type is not too important as far as waterfowl are concerned, although wood and black ducks feed in it occasionally when it borders permanent open water or contains shallow pools.

Type 7 - Wooded swamps - Soil is waterlogged and often covered with as much as 1 foot of water. Vegetation consists of trees such as red maple, ash, and elm. This type is important as a nesting and feeding area to the wood and black ducks when it borders permanent open water.

Type 8 - Bogs - This type is not too common in Massachusetts. It is estimated that there are less than 1,000 acres in the entire State. The acid soil is usually waterlogged and contains both woody and herbaceous plants of the heath family, as well as sedges and sphagnum moss. Like the wooded swamp, it is important to waterfowl only where it borders permanent open water.

Type 12 - Shallow fresh marshes - Similar to Type 3 of the Inland series in physical characteristics, this type borders coastal marshes where at high tide it is covered with as much as 6 inches of water. The major plant species are bulrush, threesquare, and cattail. Where Giant Reed, Phragmites, is not too dense, it is important as cover for migrating and nesting ducks and as a feeding ground.

Type 13 - Deep fresh marshes - In this type the soil is covered at average high tide with as much as 3 feet of water. It contains such vegetation as wildrice, bulrush, and pickerelweed and is of high value as feeding and nesting ground for ducks.

Type 14 - Open fresh water - This consists of water of variable depth located in tidal rivers and sounds. Vegetation is composed of sago pondweed, naiads, duckweeds, etc. It is an important type for waterfowl due to its food producing ability.

Type 16 - Salt meadows - Although the soil of this type is water-logged, it is only covered by water when there are storms or higher than average tides. The vegetation is largely saltmeadow cordgrass with patches of saltgrass and in the fresher parts, threesquares and fleabanes. This type is of value to waterfowl if it contains ponds and potholes.

Type 18 - Regularly flooded salt marshes - The soil of this type is covered at average high tide with as much as 3 feet of water. Vegetation is mainly saltmarsh cordgrass. It is used very much by feeding ducks and geese, particularly where ponds containing eelgrass and widgeongrass are present.

Type 19 - Sounds and bays - For the purpose of this inventory, this open salt-water type is divided into two parts. Type 19 is the area exposed at mean low tide and Type 19-P is the open water seaward from the mean low tide. Type 19, mud flats, may contain sparse colonies of eelgrass, but vegetation is usually lacking. It is of value to wintering ducks, which feed on the animal life found therein.

Waterfowl Values of Wetland Types by Physiographic Regions

Plate I shows the locations of the six physiographic regions in Massachusetts. Although some of the wetland areas

included in this inventory are located within each of these physiographic regions, over 80 percent of the total wetland acreage inventoried and practically all the high value habitat is included in the eastern third of Massachusetts, in two physiographic regions, the New England Seaboard Lowland and the Northeastern Coastal Plain.

Waterfowl values of the wetlands in the Northeastern Coastal Plain in Massachusetts are due mainly to migration and wintering use of mudflat and saltmarsh areas along the coast. The inland fresh type of wetland is not very numerous and the few that were inventoried were of comparatively low value for waterfowl, with the exception of a few small areas on Nantucket and Martha's Vineyard Islands.

The New England Seaboard Lowland region in Massachusetts contains all of Norfolk, Suffolk, Essex, and Bristol counties and the major portion of Middlesex and Plymouth Counties. Both inland and coastal type wetlands of considerable importance to waterfowl occur in this region. The coastal types are important mainly for migration use by waterfowl and, to a lesser extent, wintering and nesting; and the inland types are important for nesting black ducks and wood ducks with some migration and wintering use by various other species.

The four remaining physiographic regions show no great variation as to amount of wetland or relative value. The importance to waterfowl of wetlands in these regions is mainly dependent upon resting values, especially along the various river

and stream valleys. Away from the stream valleys, most of the wetland areas are of the wooded or shrub swamp type, with little or no open water and minor waterfowl significance. Table 1 summarizes the acreage and value of the wetlands inventoried in 1954.

Contribution of Wetland Types to Other Wildlife

Wetlands furnish habitat for a variety of fur animals and other mammals, game birds, and shore birds. Listed in table 2 are the more important species in Massachusetts and an attempted evaluation of their reliance upon the various wetland types. An evaluation of this nature is particularly difficult in that the association and interrelation of the various types are often of more importance than the presence or absence of any one particular type. However, the table should serve to emphasize the importance of wetland habitat in sustaining the wildlife species of the State.

Land-Use Changes Affecting Wetlands

Until recently most of the land-use changes affecting wetlands were confined largely to the coastal type in Massachusetts. Mosquito control drainage of salt marsh areas in the past has caused loss of original small, scattered open water areas and change of deep salt marsh to salt meadow, all to the detriment of the marsh as waterfowl habitat. Industrial and, to some extent, domestic pollutants have detracted from the value of many mudflat areas and also, in some cases, have destroyed or

Table 1.--Summary of wetland classification and evaluation - Massachusetts

Wetland Category	Wetland Type*	Wetland Acreage by Waterfowl Value				Total Acreage By Types
		High	Moderate	Low	Negligible	
Inland Fresh	1	--	95	115	150	360
	2	265	1,705	2,300	1,260	5,530
	3	1,490	1,955	1,505	155	5,105
	4	1,440	410	520	15	2,385
	5	590	800	730	50	2,170
	6	2,565	3,205	8,800	2,975	17,545
	7	355	4,720	16,770	25,865	47,710
	8	--	--	15	10	25
Coastal Fresh	12	5	505	865	--	1,375
	13	110	650	370	--	1,130
	14	170	--	--	5	175
Coastal Saline	16	11,495	14,620	6,145	--	32,260
	18	2,340	2,835	2,655	--	7,830
	19	18,380	4,330	--	--	22,710
State Totals		39,205	35,830	40,790	30,485	146,310

Table 2.--General values of wetland types to other wildlife

SPECIES	WETLAND TYPES 1	2	3	4	5	6	7	8	12	13	14	16	18	19
Muskrat		L-1a	H-1a	H-1a	M-1a	L-1a	N-3a		M-1a	H-1a	M-1a	L-1a	H-1a	
Mink	L-2cd	H-2cd	M-1a	H-1a	M-2a	L-1a	L-1a	L-1a	M-2cd	M-1a	M-2a	L-2a	L-2a	
Beaver	L-2bc	L-2bc	M-1bcd	M-1bcd	M-1a	M-1a	M-1a							
Otter		L-1bcd	L-1bcd	M-1a	H-1a				L-1bcd	L-1bcd	H-1a			
Fox	L-2a	M-2a	L-1a	L-2e		L-1a	L-1a		M-2a	L-2a				
Skunk	M-2a	M-2a	L-1a	L-1a		L-1a	L-1a		M-2a	L-1a				
Weasel	L-2a	L-2a	L-1a	L-1a		M-1a	M-1a		L-2a	L-2a				
Raccoon	M-2a	M-2a	M-2a	M-2a	L-2a	M-1a	M-1a		L-2a	L-2a	M-2a	L-2a	L-2a	
Pheasant	M-1a	M-1a	M-1de	M-3e		M-3a	L-3e		M-1a	M-1de				
Grouse	L-2d	L-2d				M-1a	M-1a							
Quail	M-2a	M-2a	M-2a			M-3a	L-3a	L-3a						
Woodcock	L-2bcd					H-1bcd	H-1bcd							
Cottontail	L-2a	L-2a				H-1a	H-1a		L-2a					
Hare						H-1a	H-1a	M-1a						
Deer	M-2cd	M-2cd	L-2cd			H-1a	H-1a		M-2cd	L-2cd				
Shorebirds			L-1bcd	L-1bcd	H-2bcd				M-1bcd	L-1bcd	H-2bcd	H-1a	H-1a	H-2a

Value Categories
H-High N-Negligible
M-Moderate
L-Low

Use Categories
1-Food, cover
2-Food
3-Cover

Time Categories
a - Year-round d - Fall
b - Spring e - Winter
c - Summer

altered vegetative growth in both fresh and saline coastal marsh areas.

The 1959 vulnerability survey indicated that this trend is still continuing and that inland wetlands are now being affected. Table 3 shows the comparison between 1955 and 1959. A total of 87,229 acres were covered in 1959. The data does not include acreages of Types 14 and 19 and those acreages of Type 5 which are now considered to be permanent water areas.

The table shows that 830 acres of high and moderate value waterfowl wetlands were destroyed in the past 4 years, amounting to slightly less than one percent of the total. Major causes of wetland destruction were found to be ditching and draining - 270 acres, highway construction - 162 acres, trash disposal areas - 126 acres, housing developments - 95 acres, industrial developments - 71 acres, parking lot construction - 20 acres, and miscellaneous fill - 16 acres.

As stated previously the coastal tidal wetlands of low and negligible waterfowl value were also surveyed in 1959. Of a total of 9,485 acres, 489 acres were found destroyed, all but 10 acres being located on Cape Cod. Housing was the chief destructive agent totalling 213 acres. Dredge filling for unknown purposes, presumably housing, totalled 134 acres, erosion destroyed 56 acres, marina developments - 40 acres, trash disposal sites - 40 acres, and fill for a parking lot - six acres. The overall total in both categories was 1,319 acres or 1.4 percent of the wetlands surveyed.

Table 3.--Wetlands vulnerability comparison of Massachusetts high and moderate waterfowl wetland values 1955 - 1959

County	1955 Vulnerability Class - Acres			1959 Vulnerability Class - Acres			Acres Lost Since 1955
	1	2	3	1	2	3	
Barnstable		6,670	1,750	170	6,526	1,658	66
Berkshire			1,025			1,025	--
Bristol		8,896	340		8,896	340	--
Essex	1,038	23,120	2,380	950	22,000	3,400	188
Hampden		40		35			5
Hampshire			200			200	--
Middlesex	5,490	550	3,640	590	6,105	2,912	73
Norfolk	220	4,450	2,570	344	4,976	1,760	160
Plymouth	1,110	16,680	1,260	310	17,417	1,260	63
Worcester	640	370	4,790	640	2,145	2,740	275
STATE TOTALS	8,498	60,776	17,955	3,039	68,065	15,295	830

Improvement of Wetlands for Wildlife

The Massachusetts Division of Fisheries and Game now owns or controls 543 acres of wetland habitat embracing practically all types. Several other State agencies also own wetland areas. Among the private conservation agencies the efforts of the Massachusetts Audubon Society and the Sudbury Valley Trustees are particularly outstanding. Wetlands owned are about 2000 and 400 acres respectively. The United States Fish and Wildlife Service owns or controls 8,014 acres of waterfowl wetland habitat in Massachusetts.

The State of Massachusetts has been a pioneer in waterfowl research work. Its work on the wood duck has been particularly outstanding. The methods developed by the Division of Fisheries and Game for the erection of artificial nesting boxes have been used by most of the States in the range of the wood duck. This large scale project has been carried out by the Division in cooperation with sportsmen's organizations.

Initial steps have been taken by the State to effect a small marsh development program on inland areas. The value of these and other projects should serve as an incentive for an intensified future management program designed to increase and improve waterfowl habitat.

To preserve and possibly increase the value of waterfowl habitat in Massachusetts, an active program of wetland acquisition and development would be desirable. The acquisition

of land, especially in eastern Massachusetts, for waterfowl habitat and public shooting will be difficult due to high real estate costs.

Summary

The wetlands of Massachusetts are distributed throughout the State, with the more valuable waterfowl areas concentrated along the coast and the major rivers and streams. Migration and wintering usage are the primary determinants of waterfowl values, while nesting is of some importance throughout the State. In 1955 and 1959 all high and moderate value wetlands, 40 acres and over, in the State of Massachusetts were surveyed as to vulnerability status. In addition, all tidal wetlands units were covered by the 1959 survey.

Results of these surveys reveal that about 1 percent of the original high and moderate waterfowl wetlands have been destroyed in the past 4 years. In addition, there has also been a loss of 489 acres of tidal marshes of low and negligible value to waterfowl. The total loss of wetlands in the areas surveyed was 1,319 acres or 1.4 percent.

Although State and Federal agencies and private conservation groups own or control several important wetland areas, an active program of wetland acquisition and development is desirable to preserve waterfowl habitat in Massachusetts.